NASA TECHNICAL MEMORANDUM

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STANDARDIZED PERFORMANCE TESTS OF COLLECTORS OF SOLAR THERMAL ENERGY - A SELECTIVELY COATED, FLAT-PLATE COPPER COLLECTOR WITH ONE TRANSPARENT COVER AND A TUBE-TO-TUBE SPACING OF $5\frac{5}{8}$ INCHES

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16. Abstract

This preliminary data report gives basic test results of a flat-plate solar collector whose performance was determined in the NASA-Lewis solar simulator. The collector was tested over ranges of inlet temperatures, fluxes and coolant flow rates. Collector efficiency is correlated in terms of inlet temperature and flux level.

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INTRODUCTION

An area presently being investigated by the NASA Lewis Research Center in its efforts to aid in the utilization of alternate energy sources is the use of solar energy for the heating and cooling of buildings. An important part of this effort is the evaluation of solar collectors which have the potential to be efficient, economical, and reliable.

This preliminary data report gives basic test results of a collector whose performance was determined in the NASA-Lewis solar simulator. In the interest of providing performance data on this collector to the technical community as quickly as possible, the basic test results reported herein are presented without evaluation. Detailed analyses and interpretation of these results may be presented in subsequent papers or reports by this Center. Some of the results contained in this report may be changed as warranted by reviews and evaluations, or by obtaining additional data on this collector.

Reference 1 describes the solar-simulator test facility, as well as the basic test procedure.

COLLECTOR DESCRIPTION

The collector was made by Sunworks, Incorporated, Guilford, Connecticut. This collector consists of a copper absorber panel (absorbing area = 13.81 ft^2) and six parallel copper flow channels. The channels are spaced 5-5/8 inches apart. The collector has a selective coating on the absorber panel and a single glazing of glass (area of glass = 14.39 ft^2). Insulation consisting of $2\frac{1}{2}$ inches of fiberglass is used to reduce conduction heat losses. A photograph of the collector on the test stand is shown in Figure 1.

TABLE I - BASIC EXPERIMENTAL DATA

50/50 Water and Ethylene Glycol
Incident Angel = 0°
Tilt Angle = 57° Above Horizontal

Flow Per Radiated Surface Area lb/hr ft^2	Flow Gal/Min	Incident Radiation Flux Btu/hr ft^2	Fluid Outlet Temp.,°F	Fluid Inlet Temp.,°F	Ambient Temp.	Efficiency
12.175	0.25626	197.94	95.465	83.006	78.165	0.62888
12.140	0.25561	293.36	102.08	83.707	79.439	0.62526
12.466	0.25925	303.86	134.65	119.59	79.772	0.51881
12.197	0.25763	295.67	168.47	157.69	78.714	0.38177
12.120	0.25602	194.39	162.20	157.75	77.877	0.23772
24.935	0.51694	292.82	90.995	81.259	79.315	0.67899
24.869	0.51594	193.38	87.002	81.729	77.366	0.65801
24.636	0.52063	196.63	127.96	124.10	79.294	0.40589
24.669	0.52128	194.70	129.14	123.96	79.191	0.45577
24.673	0.52236	202.34	168.61	166.41	81.075	0.23074
24.692	0.52235	298.22	169.59	164.25	81.125	0.37907

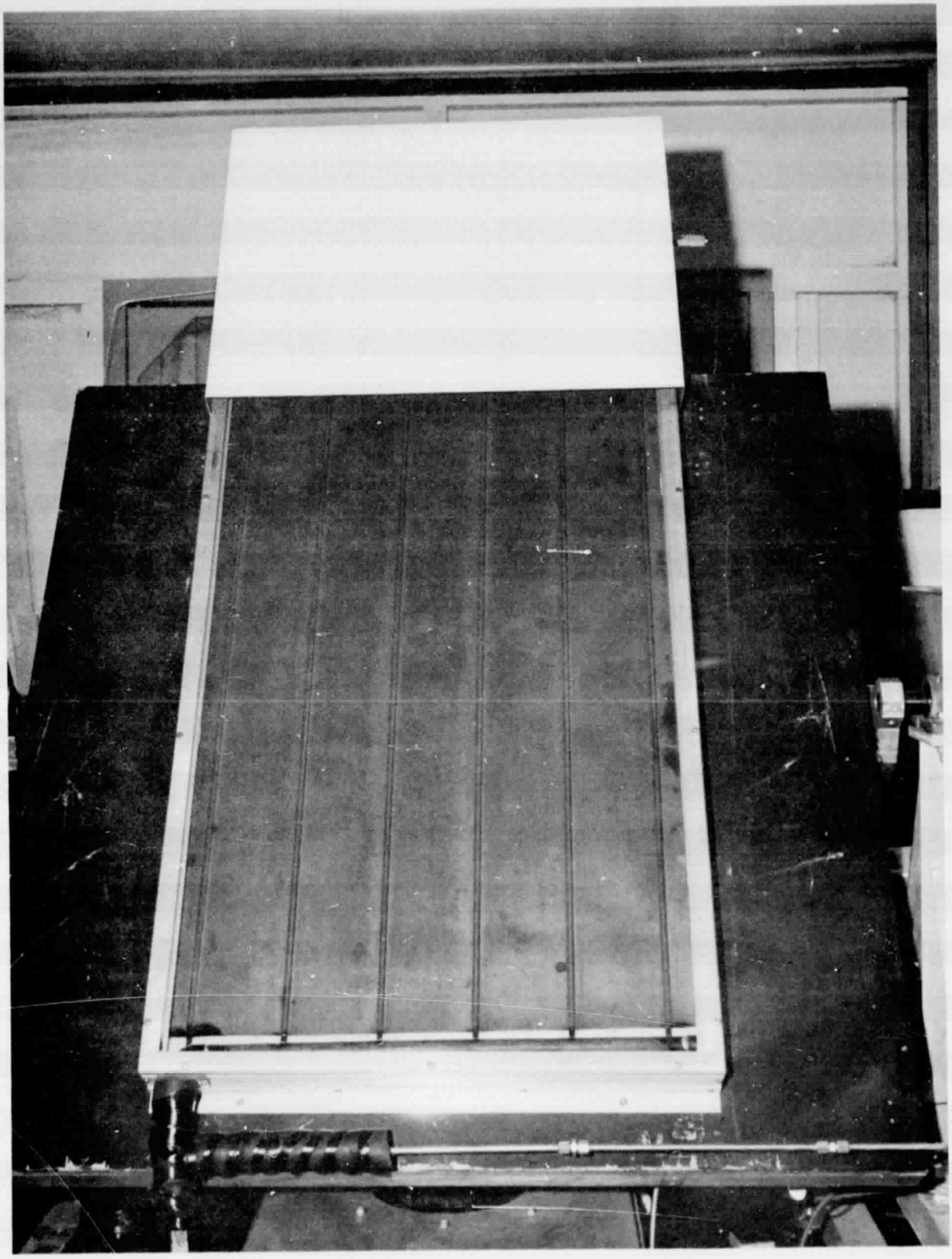

Figure 1. - Collector on the Test Stand

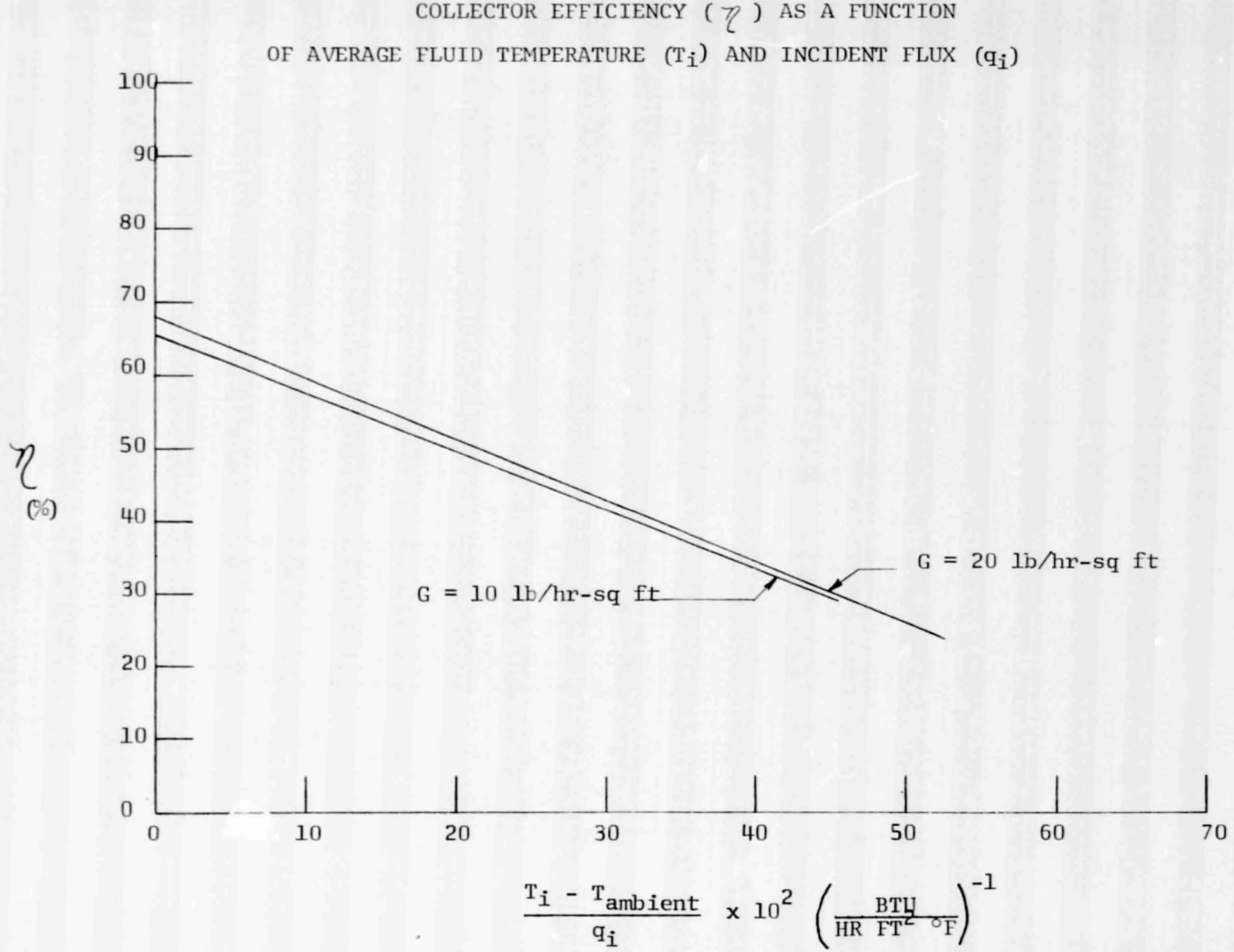

Figure 2. - Collector Performance Correlation